

# Aashutosh Mistry

Postdoctoral Researcher, Argonne National Laboratory

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Google Scholar: <https://scholar.google.com/citations?user=2dd9BcAAAAAJ&hl=en>

LinkedIn: <https://www.linkedin.com/in/a-n-mistry>

I study non-equilibrium interactions to systematically design energy storage and conversion systems. Relevant non-equilibrium interactions are reactions, species transport, fluid flow, and heat transfer. To capture the complexities of these interactions and offer predictive insights, I combine physics-based theory, controlled experiments, and data-driven analysis across molecular and continuum scales.

## Education

- 2019 **Ph.D.**, Purdue University, United States (GPA: **4.00/4.00**)  
Major Mechanical Engineering  
Dissertation Mesoscale Interactions in Porous Electrodes  
Advisor Prof. Partha Mukherjee
- 2014 **M.Tech.**, Indian Institute of Technology Kanpur, India (GPA: **10.00/10.00**)  
Major Mechanical Engineering  
Dissertation Generalized Lagrangian Model for Drop Spreading on Textured Surfaces  
Advisor Prof. Krishnamurthy Muralidhar
- 2012 **B.Tech.**, National Institute of Technology Surat, India (GPA: **9.95/10.00**)  
Major Mechanical Engineering  
Dissertation Numerical and Experimental Investigation on Heat Transfer in Nanofluids  
Advisor Prof. Jyotirmay Banerjee

## Professional Appointments

- Aug '19 – present Postdoctoral Researcher, Argonne National Laboratory  
Advisor Dr. Venkat Srinivasan  
Contributions developed a unified physics-based description to explain observations of ion transport in seemingly different battery materials (electrolytes and intercalation hosts) and across molecular and continuum scales
- Aug '17 – May '19 Graduate Student Researcher, Purdue University\*
- Jan '15 – Jul '17 Graduate Student Researcher, Texas A&M University\*  
Advisor Prof. Partha Mukherjee  
Contributions developed a theoretical understanding of how mesoscale interactions lead to an observable electrochemical response in porous electrodes for different battery chemistries, and designed experiments to verify some of the hypothesized mechanisms
- \* transitioned to Purdue University in Summer '17 with Prof. Partha Mukherjee
- Jan '18 – Dec '18 Lambert Teaching Fellow, Purdue University  
Contributions developed course material and taught undergraduate Thermodynamics II
- Jun '18 – Aug '18 Summer Intern, Argonne National Laboratory  
Advisor Dr. Venkat Srinivasan  
Contributions designed experiments and developed analysis to characterize negative effects of carbon-binder domains in Li-ion battery porous electrodes

Jun '14 – Dec '14	<b>Project Associate, IIT Kanpur</b> Supervisor      Prof. Malay Das Contributions    parallelized AnuPravaha I – a general purpose Computational Fluid Dynamics code – to run on supercomputers
Aug '12 – May '14	<b>Graduate Student Researcher, IIT Kanpur</b> Advisor          Prof. Krishnamurthy Muralidhar Contributions    developed a continuum-scale understanding for the motion of three-phase contact lines, and examined its veracity by studying the spreading of liquid drops on textured surfaces
Jun '11 – May '12	<b>Undergraduate Student Researcher, NIT Surat</b> Advisor          Prof. Jyotirmay Banerjee Contributions    developed a two species formulation to examine coupled transport processes during heat transfer in nanofluids

## Awards and Recognition

2022

- Chair, Gordon Research Seminar on Batteries, Ventura, CA [[web](#)]

2021

- Invited speaker, Celebrating 75 years at Argonne National Laboratory, hosted by the Chicago Council on Science and Technology [[recording](#)]

2020

- Highlight, Materials360 newsletter, Electrodeposition electrodes [[web](#)]

2019

- Graduate Student Award, Materials Research Society [[web](#)]
- Hot paper, Journal of Materials Chemistry A, Li-oxygen battery porous electrodes [[web](#)]

2018

- College of Engineering Outstanding Research Award, Purdue University
- Edward G. Weston Summer Fellowship, The Electrochemical Society [[web](#)]
- Lambert Graduate Teaching Fellowship, School of Mechanical Engineering, Purdue University
- Travel Grant, The Electrochemical Society's Spring Meeting
- Journal cover art, ACS Applied Materials & Interfaces, Li-ion battery porous electrodes [[web](#)]
- Editors' choice article, Journal of the Electrochemical Society, Li-ion battery porous electrodes [[web](#)]
- Featured news report, Materials Research Society Bulletin, Li-ion battery porous electrodes [[web](#)]
- Inaugural speaker, Graduate Sandbox Seminar, School of Mechanical Engineering, Purdue University (24<sup>th</sup> Jan)

2017

- Featured news report, Materials Research Society's Fall Meeting, Thermal effects in Li-ion battery electrodes [[web](#)]

2015

- First prize, poster presentation, Texas A&M Non-fossil-based Technologies for Energy Workshop (24<sup>th</sup> Jun)

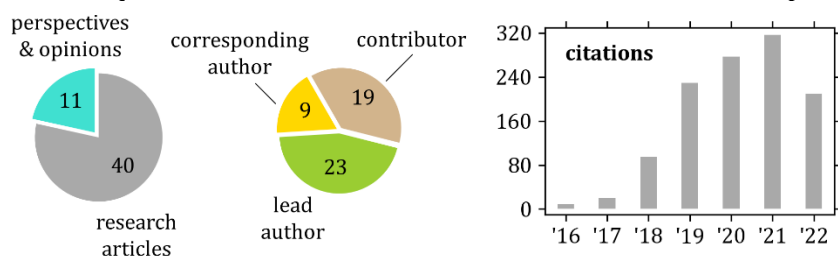
2014

- Inaugural Sashi Pundir Memorial Gold Medal for the best Master's thesis in Fluid Mechanics and Transport Phenomena, IIT Kanpur
- Academic Excellence Award, IIT Kanpur

2012

- Smt. Laxmi Bala Majumdar Gold Medal for securing the 1<sup>st</sup> merit rank across all disciplines of Bachelor of Technology, NIT Surat
- Siddhartha Gupta Gold Medal for securing the 1<sup>st</sup> merit rank across all disciplines of Bachelor of Technology, NIT Surat
- Gold Medal for securing the 1<sup>st</sup> merit rank in Bachelor of Technology, Mechanical Engineering, NIT Surat
- Siddhartha Gupta Gold Medal for securing the 1<sup>st</sup> merit rank in Bachelor of Technology, Mechanical Engineering, NIT Surat

### Journal Publications (citations 1160; h-index 20; i10-index 30; \*corresponding author)



### Perspectives and Opinions

11. **(invited)** Toward Bottom-up Understanding of Transport in Concentrated Battery Electrolytes  
A. Mistry, Z. Yu, B. Peters, C. Fang, R. Wang, L. Curtiss, N. Balsara, L. Chang and V. Srinivasan (2022) ACS Central Science, *accepted*
10. **(invited)** Do we Need an Accurate Understanding of Electrolyte Transport?  
A. Mistry\* and V. Srinivasan (2021) Joule 5(11) 2773 [\[web\]](#)
9. A Minimal Information Set to Enable Verifiable Theoretical Battery Research  
A. Mistry, A. Verma, S. Sripad, R. Ciez, V. Sulzer, F. Brosa-Planella, R. Timms, Y. Zhang, R. Kurchin, R. Dechent, W. Li, S. Greenback, Z. Ahmad, D. Krishnamurthy, A. Fenton Jr., K. Tenny, P. Patel, D. Juarez-Robles, P. Gasper, A. Colclasure, A. Baskin, C. Scown, V. Subramanian, E. Khoo, S. Allu, D. Howey, S. DeCaluwe, S. Robert, V. Viswanathan (2021) ACS Energy Letters 6(11) 3831 [\[web\]](#)
8. **(invited)** Ion Dynamics in Battery Materials Imaged Rapidly  
A. Mistry\* (2021) Nature 594(7864) 503 [\[web\]](#)
7. How Machine Learning will Revolutionize Electrochemical Sciences  
A. Mistry,\* A. Franco, S. Cooper, S. Roberts and V. Viswanathan (2021) ACS Energy Letters 6(4) 1422 [\[web\]](#)
6. **(invited)** A Non-Sci-Fi-ish take on Machine Learning for Scientific Discoveries  
A. Mistry\* (2021) American Physical Society – Forum for Early Career Scientists Spring Newsletter [\[web\]](#)

5. Making a Case for Battery Modeling  
D. Howey, S. Roberts, V. Viswanathan, **A. Mistry**, M. Beuse, E. Khoo, S. DeCaluwe and V. Sulzer (2020) The Electrochemical Society Interface 29(4) 30 [[web](#)]
4. **(invited)** On our Limited Understanding of Electrodeposition  
**A. Mistry\*** and V. Srinivasan (2019) MRS Advances 4(51-52) 2843 [[web](#)]
3. Mesoscale Physics in the Catalyst Layer of Proton Exchange Membrane Fuel Cells: a Critical Perspective  
J. Grunewald, **A. Mistry**, A. Verma, N. Goswami, P. Mukherjee and T. Fuller (2019) Journal of the Electrochemical Society 166(7) F3089 [[web](#)]
2. Mesoscale Physicochemical Interactions in Lithium-sulfur Batteries: Progress and Perspective  
Z. Liu, **A. Mistry** and P. Mukherjee (2017) Journal of Electrochemical Energy Conversion and Storage 15(1) 010802 [[web](#)]
1. State-of-the-art and Future Research Needs for Multiscale Analysis of Li-ion Cells  
K. Shah, N. Balsara, S. Banerjee, M. Chintapalli, A. Cocco, W. Chiu, I. Lahari, S. Martha, **A. Mistry**, P. Mukherjee, V. Ramadesigan, C. Sharma, V. Subramanian, S. Mitra and A. Jain (2017) Journal of Electrochemical Energy Conversion and Storage 14(2) 020801 [[web](#)]

#### Research Articles

40. Effect of Solvent Motion on Ion Transport in Electrolytes  
**A. Mistry**, L. Grundy, D. Halat, J. Newman, N. Balsara and V. Srinivasan (2022) Journal of the Electrochemical Society 169(4) 040524 [[web](#)]
39. Investigating Charge Transport in  $\text{MgCr}_2\text{O}_4$  extends Understanding of Battery Intercalation Hosts  
(joint first author) I. Johnson, **A. Mistry**, L. Yin, M. Murphy, M. Wolfman, T. Fister, S. Lapidus, J. Cabana, V. Srinivasan and B. Ingram (2022) *under review*
38. Asphericity can cause Nonuniform Lithium Intercalation in Battery Active Particles  
**A. Mistry\***, T. Heenan, K. Smith, P. Shearing and P. Mukherjee (2022) ACS Energy Letters, 7(5) 1871 [[web](#)]
37. Quantifying Negative Effects of Carbon-binder Networks from Electrochemical Performance of Porous Li-ion Electrodes  
**A. Mistry**, S. Trask, A. Dunlop, G. Jeka, B. Polzin, P. Mukherjee and V. Srinivasan (2021) Journal of the Electrochemical Society 168(7) 070536 [[web](#)]
36. Fingerprinting Redox Heterogeneity in Electrodes during Extreme Fast Charging  
**A. Mistry**, F. Usseglio-Viretta, A. Colclasure, K. Smith and P. Mukherjee (2020) Journal of the Electrochemical Society 167(9) 090542 [[web](#)]
35. Molar Volume Mismatch: a Malefactor for Irregular Metallic Electrodeposition with Solid Electrolytes  
**A. Mistry\*** and P. Mukherjee (2020) Journal of the Electrochemical Society 167(8) 082510 [[web](#)]
34. Stochasticity at Scales Leads to Lithium Intercalation Cascade  
**A. Mistry**, K. Smith and P. Mukherjee (2020) ACS Applied Materials and Interfaces 12(14) 16359 [[web](#)]
33. Deconstructing Electrode Pore Network to Learn Transport Distortion  
**A. Mistry** and P. Mukherjee (2019) Physics of Fluids 31(12) 122005 [[web](#)]
32. Controllable Electrode Stochasticity Self-heats Lithium-ion Batteries at Low Temperatures  
**A. Mistry**, A. Verma and P. Mukherjee (2019) ACS Applied Materials and Interfaces 11(30) 26764 [[web](#)]

31. Electrolyte Confinement alters Lithium Electrodeposition  
A. **Mistry**, C. Fear, R. Carter, C. Love and P. Mukherjee (2019) ACS Energy Letters 4(1) 156 [[web](#)]
30. **(hot paper)** Non-equilibrium Thermodynamics in Electrochemical Complexation of Li-oxygen Porous Electrodes  
A. **Mistry**, F. Cano-Banda, D. Law, A. Hernandez-Guerrero and P. Mukherjee (2019) Journal of Materials Chemistry A 7(15) 8882 [[web](#)]
29. *In Operando* Thermal Signature Probe for Lithium-ion Batteries  
A. **Mistry**, H. Palle and P. Mukherjee (2019) Applied Physics Letters 114(2) 023901 [[web](#)]
28. Materials by Design: Tailored Morphology and Structures of Carbon Anodes for Enhanced Battery Safety  
(joint first author) R. Adams, A. **Mistry**, P. Mukherjee and V. Pol (2019) ACS Applied Materials and Interfaces 11 (14) 13334 [[web](#)]
27. **(invited)** Curvature Effects in Precipitation Dynamics  
A. **Mistry**\* (2018) The Electrochemical Society Interface 27(4) 80 [[web](#)]
26. Probing Spatial Coupling of Resistive Modes in Porous Intercalation Electrodes through Impedance Spectroscopy  
A. **Mistry** and P. Mukherjee (2018) Physical Chemistry Chemical Physics 21(7) 3805 [[web](#)]
25. 'Shuttle' in Polysulfide Shuttle: Friend or Foe?  
A. **Mistry** and P. Mukherjee (2018) The Journal of Physical Chemistry C 122(42) 23845 [[web](#)]
24. Electrochemistry-coupled Mesoscale Complexations in Electrodes Lead to Thermo-electrochemical Extremes  
A. **Mistry**, K. Smith and P. Mukherjee (2018) ACS Applied Materials and Interfaces 10(34) 28644 [[web](#)]
23. **(cover art)** Secondary Phase Stochastics in Lithium-ion Battery Electrodes  
A. **Mistry**, K. Smith and P. Mukherjee (2018) ACS Applied Materials and Interfaces 10(7) 6317 [[web](#)]
22. Electrolyte Transport Evolution Dynamics in Lithium-sulfur Batteries  
A. **Mistry** and P. Mukherjee (2018) The Journal of Physical Chemistry C 122(32) 18329 [[web](#)]
21. Spreading of a Pendant Liquid Drop underneath a Textured Substrate  
A. **Mistry** and K. Muralidhar (2018) Physics of Fluids 30(4) 042104 [[web](#)]
20. Precipitation – Microstructure Interaction in the Li-Sulfur Battery Electrode  
A. **Mistry** and P. Mukherjee (2017) The Journal of Physical Chemistry C 121(47) 26256 [[web](#)]
19. Probing Impedance and Microstructure Evolution in Lithium-sulfur Battery Electrodes  
(joint first author) C.-F. Chen, A. **Mistry** and P. Mukherjee (2017) The Journal of Physical Chemistry C 121(39) 21206 [[web](#)]
18. Analysis of Long-range Interaction in Lithium-ion Battery Electrodes  
A. **Mistry**, D. Juarez-Robles, M. Stein IV, K. Smith and P. Mukherjee (2016) Journal of Electrochemical Energy Conversion and Storage 13(3) 031006 [[web](#)]
17. Axisymmetric Model of Drop Spreading on a Horizontal Surface  
A. **Mistry** and K. Muralidhar (2015) Physics of Fluids 27(9) 092103 [[web](#)]
16. **(invited)** Convolutional Neural Networks for Problems in Transport Phenomena: a Theoretical Minimum  
A. Bhasin and A. **Mistry**\* (2022) Journal of Flow Visualization and Image Processing, *under review*
15. Electric Field-induced Spatially Dynamic Heterogeneity of Solvent Motion and Cation Transference in Electrolytes

- D. Halat, C. Fang, D. Hickson, **A. Mistry**, J. Reimer, N. Balsara and R. Wang (2022) Physical Review Letters, 128 (19) 198002 [\[web\]](#)
14. **(invited)** The Transference Number  
K. Gao, C. Fang, D. Halat, **A. Mistry**, J. Newman and N. Balsara, (2022) Energy & Environmental Materials, 5(2) 366 [\[web\]](#)
  13. **MATBOX: An Open-source Microstructure Analysis Toolbox for Microstructure Generation, Segmentation, Characterization, Visualization, Correlation and Meshing**  
F. Usseglio-Viretta, P. Patel, E. Bernhardt, **A. Mistry**, P. Mukherjee, J. Allen, S. Cooper, J. Laurencin and K. Smith (2021) SoftwareX, 17, 100915 [\[web\]](#)
  12. **(cover art)** Effect of Crystallite Geometries on Electrochemical Performance of Porous Electrodes by Multiscale Operando Investigation  
Y. Luo, Y. Bai, **A. Mistry**, Y. Zhang, J. Handy, S. Razaee, A. Chihpin, L. Carrillo, K. Wiaderek, M. Pharr, P. Mukherjee, B.-X. Xu and S. Banerjee (2021) Nature Materials 21, 217 [\[web\]](#)
  11. *In Operando* Detection of the Onset and Mapping of Lithium Plating Regimes during Fast Charging of Lithium-ion Batteries  
C. Fear, T. Adhikary, R. Carter, **A. Mistry**, C. Love and P. Mukherjee (2020) ACS Applied Materials and Interfaces, 12(27) 30438 [\[web\]](#)
  10. Corrosion-induced Microstructural Variability Affects Transport-Kinetics Interaction in PEM Fuel Cell Catalyst Layers  
N. Goswami, **A. Mistry**, J. Grunewald, T. Fuller and P. Mukherjee (2020) Journal of the Electrochemical Society 167(8) 084519 [\[web\]](#)
  9. Quantifying Transport, Geometrical, and Morphological Parameters in Li-ion Cathode Phases using X-ray Microtomography  
T. Rajendra, **A. Mistry**, P. Patel, L. Asuderau, X. Xiao, P. Mukherjee and G. Nelson (2019) ACS Applied Materials and Interfaces 11(22) 19933 [\[web\]](#)
  8. **(editors' choice)** Mesoscale Analysis of Conductive Binder Domain Morphology in Lithium-Ion Battery Electrodes  
B. Trembacki, **A. Mistry**, D. Noble, M. Ferraro, P. Mukherjee and S. Roberts (2018) Journal of the Electrochemical Society 165(13) E725 [\[web\]](#)
  7. Multiscale Model Reduction for Pore-scale Simulation of Li-ion Batteries using GMSFEM  
M. Vasilyeva, **A. Mistry** and P. Mukherjee (2018) Journal of Computational and Applied Mathematics 344, 73 [\[web\]](#)
  6. Electrochemistry-mechanics Coupling in Intercalation Electrodes  
N. Kotak, P. Barai, A. Verma, **A. Mistry** and P. Mukherjee (2018) Journal of the Electrochemical Society 165(5) A1064 [\[web\]](#)
  5. Resolving the Discrepancy in Tortuosity Factor Estimation for Li-ion Battery Electrodes through Micro-Macro Modeling and Experiment  
F. Usseglio-Viretta, A. Colclasure, **A. Mistry**, K. Pierre Yao, F. Pouraghajan, D. Finegan, T. Heenan, D. Abraham, P. Mukherjee, D. Wheeler, P. Shearing, S. Cooper and K. Smith (2018) Journal of the Electrochemical Society 166(14) A3403 [\[web\]](#)
  4. Mechanistic Understanding of the Role of Evaporation in Electrode Processing  
M. Stein IV, **A. Mistry** and P. Mukherjee (2017) Journal of the Electrochemical Society 164(7) A1616 [\[web\]](#)
  3. Transport-geometry Interactions in Li-ion Cathode Materials Imaged using X-ray Nanotomography

- G. Nelson, L. Ausderau, S. Shin, J. Buckley, **A. Mistry**, P. Mukherjee and V. De Andrade (2017) Journal of the Electrochemical Society 164(7) A1412 [[web](#)]
2. **Poromechanical Effect in the Lithium-sulfur Battery Cathode**  
P. Barai, **A. Mistry** and P. Mukherjee (2016) Extreme Mechanics Letters 9(3) 359 [[web](#)]
  1. **Towards Next Generation Lithium-sulfur Batteries: Non-conventional Carbon Compartments/ Sulfur Electrodes and Multi-scale Analysis**  
A. Dysart, J. Burgos, **A. Mistry**, C.-F. Chen, Z. Liu, C. Hong, P. Balbuena, P. Mukherjee and V. Pol (2015) Journal of the Electrochemical Society 163(5) A730 [[web](#)]

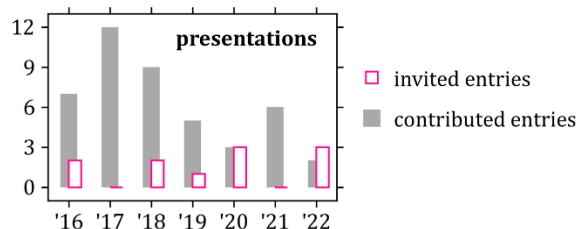
### Papers in Preparation

2. **On Relative Importance of Correlated and Uncorrelated Motions in Designing Electrolyte Transport**  
**A. Mistry**, Z. Yu, L. Chang and V. Srinivasan, *planned submission Jun '22*
1. **(invited) On the Measurement of Concentration and Velocity Profiles to Understand Ion Transport using Continuum Modeling**  
H. Steinrück, **A. Mistry** and V. Srinivasan, *Advanced Energy Materials, planned submission Jun '22*

### **Book Chapters**

4. **Modeling of Electrode, Electrolyte, as well as Interfaces related to Lithium-sulfur Batteries**  
V. Srinivasan and **A. Mistry** (2022) Introduction to Lithium-Sulfur Batteries: Advances in High-Energy Density Batteries, eds. P. Kumta A. Hepp, M. Datta, O. Velikohatnyi, Springer, *accepted*
3. **Flow and Heat Transfer during Spreading of Sessile and Pendant Drops on Partially Wetting Surfaces**  
**A. Mistry** and K. Muralidhar (2020) Drop Dynamics and Dropwise Condensation on Textured Surfaces, eds. S. Khandekar, K. Muralidhar, Springer [[web](#)]
2. **Porous Media Applications: Electrochemical Systems**  
P. Mukherjee, **A. Mistry** and A. Verma (2017) Modeling Transport Phenomena in Porous Media with Applications, eds. M. Das, P. Mukherjee, K. Muralidhar, Springer [[web](#)]
1. **Mesoscale Interactions of Transport Phenomena in Polymer Electrolyte Fuel Cells**  
P. Mukherjee, A. Verma and **A. Mistry** (2017) Modeling Transport Phenomena in Porous Media with Applications, eds. M. Das, P. Mukherjee, K. Muralidhar, Springer [[web](#)]

### **Research Presentations (only presenting author entries)**



### Invited Entries

May '22      Chemical Sciences and Engineering Division, Argonne National Laboratory,  
Lemont, IL  
Toward Multiscale Understanding of Species Transport in Battery Electrolytes



- Apr '22 Joint Center for Energy Storage Research (JCESR) Full Program Meeting, Argonne National Laboratory, Lemont, IL  
How do Mg-ions transport in  $\text{MgCr}_2\text{O}_4$ ?
- Mar '22 Department of Mechanical Engineering and Applied Mechanics (MEAM) Seminar, University of Pennsylvania, Philadelphia, PA  
Unknown Unknowns in Designing Porous Intercalation Electrodes for Batteries [[web](#)]
- Jul '20 Joint Center for Energy Storage Research (JCESR) Webinar, Argonne National Laboratory, Lemont, IL  
Transport in Concentrated Electrolytes: Bridging Molecular and Continuum Views
- Jun '20 ARTISTIC project (granted by European Research Council) Webinar, Université de Picardie Jules Verne and Laboratoire de Réactivité et Chimie des Solides, France  
"Misfits" in Porous Li-ion Electrodes: Secondary Solids and Inhomogeneities [[recording](#)]
- Feb '20 TMS 2020, 149<sup>th</sup> Annual Meeting and Exposition, San Diego, CA  
Are Ion-pairs Detrimental to Electrodeposition Stability?
- Apr '19 Materials Research Society's Spring Meeting, Phoenix, AZ  
(MRS Graduate Student Award talk) Interfacial Effects in Concentration-driven Phase Change
- Feb '18 Gordon Research Seminar on Batteries, Ventura, CA  
Inverse Formulations for Consistent Thermo-Electro-Chemical Characterization of Li-ion Batteries
- Jan '18 Graduate Sandbox Seminar, School of Mechanical Engineering, Purdue University, West Lafayette, IN  
Microstructure Mediated Thermo-Electrochemical Interactions in Energy Storage
- Jul '16 College of Multiscale Computational Modeling of Materials for Energy Applications, International Center for Theoretical Physics, Trieste, Italy
2. Modeling and Analysis of Electrochemical Performance of Lithium-Sulfur Batteries
1. Improving Discharge Performance of Li-air Batteries with Electrode Microstructural Modifications
- Jun '16 Indo-US Workshop on Recent Advances in Multiscale Multiphysics Analysis of Energy Conversion in Li-ion Batteries, IIT Bombay, India
2. Mesoscale Modeling of Transport Limitations during Discharge of a Li-S Cell
1. Long-Range Interaction in Lithium-Ion Battery Electrodes

### Contributed Entries

- Jun '22 Gordon Research Conference on Batteries, Ventura, CA  
Solvent Motion in the absence of Bulk Electrolyte Flow
- May '22 Monthly Electrochemical Energy Storage Modeling Meeting, Argonne National Laboratory, Lemont, IL  
Diffusing Molecularly with Stefan, Maxwell and Newman
- Dec '21 Electrochemical Energy Storage Seminar, Argonne National Laboratory, Lemont, IL  
Unknown Unknowns in Designing Porous Intercalation Cathodes
- Oct '21 240<sup>th</sup> Meeting of the Electrochemical Society, Orlando, FL  
Examining Solvent Motion in Polarized Concentrated Electrolytes
- Jul '21 One-minute Pitch Competition, Chemical Sciences and Engineering Division, Argonne National Laboratory, Lemont, IL  
Piecing together Lithium Nucleation in 4D



- Jun '21 Monthly Electrochemical Energy Storage Modeling Meeting, Argonne National Laboratory, Lemont, IL  
Understanding Electrochemical Signatures of Li-nucleation
- Mar '21 Joint Center for Energy Storage Research (JCESR) Solid Solvation Meeting, Argonne National Laboratory, Lemont, IL  
Do Mg-ion Particles intercalate like Li-ion? – Insights from  $\text{MgCr}_2\text{O}_4$   
Chemical Sciences and Engineering Division Seminar, Argonne National Laboratory, Lemont, IL  
Do Mg-ion Particles intercalate like Li-ion? – Insights from  $\text{MgCr}_2\text{O}_4$
- Aug '20 Monthly Electrochemical Energy Storage Modeling Meeting, Argonne National Laboratory, Lemont, IL  
How does Solvent flow in Concentrated Electrolytes?
- Feb '20 Gordon Research Conference on Batteries, Ventura, CA  
Ion-transport from Microscopic to Continuum Scales  
Electrochemical Energy Storage Seminar, Argonne National Laboratory, Lemont, IL  
How Ion-pairs alter Electrolyte Transport: A Continuum Perspective
- May '19 235<sup>th</sup> Meeting of the Electrochemical Society, Dallas, TX  
2. Long-range Origins of Electrodeposition Instability in Solid Electrolytes  
1. Probing Signatures of Thermal Metastability in Lithium-ion Batteries
- Apr '19 Materials Research Society's Spring Meeting, Phoenix, AZ  
2. Microstructural Complexations in Extreme Fast Charging of Li-ion Batteries  
1. Mechanistic Origins of Lithium Plating with Solid Electrolytes
- Mar '19 American Physical Society's March Meeting, Boston, MA  
Elucidating Electrodeposition Instability at the Solid-solid Interface
- Aug '18 Computer-Aided Engineering for Electric-Drive Vehicle Batteries (CAEBAT-3) Review Meeting, Oak Ridge National Laboratory, Oak Ridge, TN  
Electrode Microstructure based Analysis and Simulations for Li-ion Batteries  
American Chemical Society's National Meeting, Boston, MA  
Mesoscale Insights into Li-sulfur Battery Charge Transport
- Jul '18 13<sup>th</sup> World Congress on Computational Mechanics, New York, NY  
A Statistical Learning-based Characterization of Lithium-ion Battery Electrodes
- May '18 233<sup>rd</sup> Meeting of the Electrochemical Society, Seattle, WA  
3. Transport and Electrochemical Dynamics in the Li-S Battery Electrolyte  
2. Analyzing the Importance of Particle Morphology and Heterogeneity in Li-ion Battery Electrodes  
1. Analyzing Microstructural and Electrolyte Phase Limitations in Li-air Battery Performance
- Mar '18 TMS 2018, 147<sup>th</sup> Annual Meeting and Exposition, Phoenix, AZ  
Mechanistic Understanding of Transport-mechanics Interactions in Li-S Cathodes
- Feb '18 Gordon Research Conference on Batteries, Ventura, CA  
Electrode Stochastics in Energy Storage  
Prospective Graduate Student Reception, School of Mechanical Engineering, Purdue University, West Lafayette, IN  
Mesoscale Physics and Stochastics in Energy Storage and Conversion
- Dec '17 Materials Research Society's Fall Meeting, Boston, MA  
Thermal Cross-talk in Lithium-ion Battery Safety

- Nov '17 International Mechanical Engineering Congress & Exposition – IMECE 2017, Tampa, FL  
Simulated Calorimetry based Thermal Characterization of Lithium-ion Cells
- Oct '17 Advanced lithium Batteries for Automotive Applications – ABAA 2017, Oakbrook, IL  
Hysteresis in Li-S Battery Performance  
232<sup>nd</sup> Meeting of the Electrochemical Society, National Harbor, MD
2. Microstructural Limitations in Lithium-sulfur Battery Performance
1. Non-intercalating Phases and Electrochemical Behavior of Lithium-ion Battery Cathode
- Sep '17 Computer-Aided Engineering for Electric-Drive Vehicle Batteries (CAEBAT-3) Review Meeting, Purdue University, West Lafayette IN  
Electrode Microstructure based Analysis and Simulations for Li-ion Batteries  
Hawkins Lecture Poster Presentations, School of Mechanical Engineering, Purdue University, West Lafayette, IN  
Mesoscale Physics and Stochastics in Energy Storage
- Jun '17 Advanced Automotive Battery Conference – AABC 2017, San Francisco, CA  
Virtual Electrode Engineering: From Mesoscale Underpinnings to System Characteristics
- Apr '17 Materials Research Society's Spring Meeting, Phoenix, AZ  
Demystifying Microstructure Limitations in Li/S Cells: Surface Passivation vs. Pore Blockage
- Mar '17 Computer-Aided Engineering for Electric-Drive Vehicle Batteries (CAEBAT-3) Review Meeting, Oak Ridge National Laboratory, Oak Ridge, TN  
Li-ion Battery Electrode Microstructure Stochasticity
- Mar '17 TMS 2017, 146<sup>th</sup> Annual Meeting and Exhibition, San Diego, CA  
Mesoscale Probing of Transport-Interface Interaction in Lithium-ion Battery Electrodes
- Feb '17 ESS Safety Forum 2017, Santa Fe, NM  
Thermo-electrochemical Analytics in Li-ion Battery Safety
- Nov '16 12<sup>th</sup> Annual Lithium Battery Power Conference, Bethesda, MD  
Mesoscale Modeling of Transport Limitations during Discharge of a Li-S cell
- Sep '16 Computer-Aided Engineering for Electric-Drive Vehicle Batteries (CAEBAT-3) Review Meeting, National Renewable Energy Laboratory, CO  
Electrode Microstructure based Analysis and Simulations for Li-ion Batteries
- May '16 229<sup>th</sup> Meeting of the Electrochemical Society, San Diego, CA
2. Precipitation Induced Stress and Degradation in the Lithium-sulfur Battery Cathode
1. Image-based Reconstruction and Statistical Characterization of the Li-ion Battery Electrode Microstructure
- Interpore 2016, Cincinnati, OH  
Mesoscale Modeling of the Physicochemical Interplay in the Li-sulfur Battery Porous Cathode
- Apr '16 Material Challenges in Alternative and Renewable Energy – MCARE 2016, Clearwater, FL
2. How Electrode Processing Affects Li-ion Battery Performance?
1. Physicochemical Evolution Behavior in the Li-air Battery Electrode
- Nov '15 International Mechanical Engineering Congress & Exposition – IMECE 2015, Houston, TX  
A Two-way Coupled Mechano-Electrochemical Model for Estimating Active Material Degradation in Lithium-ion Battery Electrodes

- Oct '15      52<sup>nd</sup> Annual Technical Meeting of Society of Engineering Sciences – SES 2015, College Station, TX  
Correlating Precipitation Morphology in the Air Electrode to the Lithium-air Battery Discharge Performance
- Jun '15      Texas A&M Non-fossil based Technologies for Energy Workshop Investigating Chemical and Electrochemical Interactions during Discharge of a Lithium-Sulfur Cell
- Mar '14      Graduate Poster Presentation, Department of Mechanical Engineering, IIT Kanpur, India  
Prediction of Drop Spreading in a Lagrangian Framework

### Conference Proceedings

4.      Non-isothermal Spreading of Liquid Drops: Effect of Fluid Convection  
A. Mistry and K. Muralidhar, Asian Symposium on Computational Heat Transfer and Fluid Flow, November 2015
3.      Study of Front Tracking Methodology for Simulation of Multiphase Flow  
A. Mistry and K. Muralidhar, Proceedings of Fortieth National Conference on Fluid Mechanics and Fluid Power, December 2013
2.      Modeling of Polymer Electrolyte Membrane (PEM) Fuel Cell Cathode with Agglomerate Catalyst Layer  
A. Mistry, A. Verma and M. Das, Proceedings of Fortieth National Conference on Fluid Mechanics and Fluid Power, December 2013
1.      A Comparative Analysis of Single-phase and Two-fluid Model for Nanofluid Heat Transfer in Forced Convection Regime  
A. Mistry and J. Banerjee, Proceedings of Thirty-Ninth National Conference on Fluid Mechanics and Fluid Power, December 2012

### Synergistic Activities

#### Teaching Experience

##### *Lambert Teaching Fellowship*

Fall '18	ME300 Thermodynamics II	36 students
Spring '18	ME300 Thermodynamics II – selected topics	40 students

##### *Teaching Assistantships*

Spring '14	ME649 Experimental Methods in Thermal Sciences	18 students
Fall '13	ME685 Programming and Numerical Analysis	22 students
Spring '13	ME231 Fluid Mechanics	105 students

##### *Lectures and Workshops*

Dec '20	Programming: an Art or a Science?, Argonne Mini-series: Computing Across Sciences, Argonne National Laboratory, IL
Jul '14	How to become Friends with MATLAB?, IIT Kanpur
Aug '13	Basics of MATLAB programming, IIT Kanpur
Mar '12	Application of Mathematics in “Real-life Problems”, NIT Surat
Sep '10	Steering and Differential, NIT Surat

Student Mentoring

Aug '18 – May '19	Prathamesh Sankhe	B. S., Purdue University, IN
Jan '17 – May '17	Serdar Ozguc	B. S., Texas A&M University, TX
May '16 – Jul '16	Akash Verma	B. Tech. IIT Kanpur, India
Sep '15 – Dec '15	AggieChallenge 2015	Texas A&M University, TX
May '15 – Jul '15	Leigha Lewis	B. S., Sam Houston State University, TX
May '15 – Jul '15	Mohit Singhal	B. Tech., IIT Kanpur, India
May '15 – Jul '15	Aditya Tiwari	B. Tech., NIT Surat, India

Society Affiliations

Oct '18 – present	American Physical Society (APS)
Mar '17 – present	Materials Research Society (MRS)
Nov '15 – present	The Electrochemical Society (ECS)

Peer Reviewer

Nature, Nature Communications, Joule, Physics of Fluids, Journal of the Electrochemical Society, ACS Applied Materials and Interfaces, npj Computational Materials, Ultramicroscopy, ASME Journal of Electrochemical Energy Storage and Conversion, Computational Materials Science, RSC Advances, ACS Omega, MRS Advances

Jun '20 – present	French National Research Agency (ANR)
Feb '20 – present	Visiting Faculty Program, Argonne National Laboratory
Feb '20 – present	US Department of Energy (DOE)

Conferences      IMECE 2019, InterPACK 2019, ASME Power & Energy Conference 2018, IEEE ITherm 2018, IEEE ITherm 2017

Committees and Conferences

Jun '22	Chair, Gordon Research Seminar on Batteries, Ventura, CA [ <a href="#">web</a> ]
Apr '22	Contributor, Revision to Master's Degree Curriculum, Department of Mechanical Engineering, NIT Surat
Mar '22	Volunteer, Bridging The Gap: Advancing America's Battery Manufacturing and Supply Chain, a two-day workshop convened by Li-bridge [ <a href="#">web</a> ]
Jan '22	Moderator, Illinois Regional Middle School Science Bowl
Mar '21 – present	Member, Lab Structure and Process Implementation Team, Argonne Action Collaborative, Argonne National Laboratory, IL
Jan '21	Moderator, Illinois Regional Middle School Science Bowl
Jul '20 – present	Co-organizer, Battery Modeling Webinar Series [ <a href="#">web</a> ]
Feb '20	Discussion leader, Gordon Research Seminar on Batteries, Ventura, CA [ <a href="#">web</a> ] Session chair, TMS 2020, San Diego, CA

Apr '19 Meeting scene reporter at MRS Spring meeting  
Nov '17 Meeting scene reporter at MRS Fall meeting  
Apr '17 Meeting scene reporter at MRS Spring meeting  
Sep '16 Co-organizer, Inaugural Texas A&M Energy Conference  
May '16 Volunteer, 229<sup>th</sup> meeting of the Electrochemical Society, San Diego, CA  
Aug '14 Co-organizer, IIT Kanpur Student Research Convention

#### Judging Experience

Nov '21 Annual Postdoctoral Research and Career Symposium, Argonne National Laboratory, IL  
Apr '21 Illinois Skyway STEM Competition  
Nov '20 Annual Postdoctoral Research and Career Symposium, Argonne National Laboratory, IL  
Feb '20 2020 Illinois Louis Stokes Alliance for Minority Participation (LSAMP) Symposium  
Jan '20 2020 Illinois Regional Middle School Science Bowl  
Dec '19 Science fair, Decatur Classical School, Chicago, IL  
Sep '16 Inaugural Texas A&M Energy Conference  
Aug '16 Summer Undergraduate Research Poster Competition, Texas A&M University  
Aug '15 Summer Undergraduate Research Poster Competition, Texas A&M University

#### Community Outreach

May '22 Career Talk, Socorro Sandoval Elementary School, Chicago, IL  
Apr '22 Career Talk, Haines Elementary School, Chicago, IL  
Feb '22 Contributor, Legacy of Innovation Campaign, Project SYNCERE, Chicago, IL  
Feb '22 Career Talk, Erie Neighborhood House, Chicago, IL  
Feb '22 Lunch with a Researcher, Argonne National Laboratory, IL  
Sep '21 Celebrating 75 years at Argonne National Laboratory: Batteries of Tomorrow, hosted by the Chicago Council on Science and Technology, IL  
[\[recording\]](#)  
Aug '21 Career Talk, All About Energy, Argonne National Laboratory, IL  
Apr '21 Career Talk, Adler Planetarium, Chicago, IL  
Apr '21 Career Talk, School District 155, Crystal Lake, IL  
Feb '21 Lunch with a Researcher, Argonne National Laboratory, IL  
Nov '20 Career Talk, Saint Viator High School, Arlington Heights, IL  
Sep '20 Q&A with High School students, Argonne National Laboratory, IL  
Jun '20 Lunch with a Researcher, Argonne National Laboratory, IL

#### Scientific Journalism

2021

46. Leveraging Reactions to Fabricate Photoanodes for Oxygen Production [\[web\]](#)

2020

45. Electrochemical High-speed AFM Dynamically Probes Fast-charging Battery Materials [[web](#)]
44. Glassy Lithium forms Superior Metal Anode for Rechargeable Li Batteries [[web](#)]
- 2019
43. Advanced Instrumentation enables Continuous High-resolution X-ray Ptychography [[web](#)]
42. Materials Needs for Energy Sustainability by 2050 – Incentivizing a Zero Waste Future [[web](#)]
41. Synthesis and Characterization of Fast Li-ion Conducting Solid-State Electrolytes [[web](#)]
40. Electron Microscopy for All-solid-state Batteries – Addressing Challenges at Atomic Scale [[web](#)]
39. Nano-scale Effects on Grain Growth – Grain Boundary Energy and Velocity in Magnesium Aluminate [[web](#)]
38. Waterbowls – Reducing Impacting Droplet Interactions by Momentum Redirection [[web](#)]
37. Evidences of Structural Metastability and Reversibility for Voltage Decay in High-Capacity Li-rich Layered Cathode Oxides [[web](#)]
36. Interfacial Engineering of Solid-State Interfaces to Enable All Solid State Batteries [[web](#)]
35. Growth and Properties of Lithium Thin Films for Solid State Batteries [[web](#)]
34. Mechanisms of Critical Current Densities in Solid Electrolytes for Preventing the Lithium Metal Penetration [[web](#)]
33. Thin Film Technology – Opening New Frontiers for 3D Solid-State Energy Storage [[web](#)]
32. Graphite Lithiation Under Fast Charging Conditions – Atomistic Modeling Insights [[web](#)]
31. Solvate Ionic Liquids and Their Polymer Electrolytes – Possible Beyond LIB Electrolytes [[web](#)]
- 2018
30. Dislocation Dynamics explain Voltage Fade in Layered-oxide Battery Materials [[web](#)]
- 2017
29. Asphalt Porous Structure Enables Fast-charging High-capacity Li Metal Anode [[web](#)]
28. Bio-inspired Bistable Shape-changing Displacement Sensors [[web](#)]
27. Data Mining in Small-scale Plasticity [[web](#)]
26. Bio-inspired Anti-fogging Materials: from the Mosquito Effect to the Cicada Effect [[web](#)]



25. Analyzing the Stability and Kinetics of the Li metal – solid electrolyte Interface [\[web\]](#)
24. Safe, High-energy-density Solid-state Li Batteries [\[web\]](#)
23. Enhancing Superhydrophobicity and Icephobicity through Surface Flexibility Inspired by Butterfly Wings [\[web\]](#)
22. Phase Field Models and Interfacial Evolution: a Critical Test of Simulation [\[web\]](#)
21. Benchmarking Problems for Phase Field Codes [\[web\]](#)
20. Controlling the Electrical Properties of Organic Electronics: a Path Towards Low-power Printed Electronics [\[web\]](#)
19. Design of Lubricant Infused Surfaces [\[web\]](#)
18. Enhancing Understanding of the Solid-electrolyte Interface: Multi-modal Characterization of Battery Systems [\[web\]](#)
17. Graphene Quantum Dots from Coal [\[web\]](#)
16. The DAGS chemistry: Droplet Assisted Growth and Shaping for Synthesis of Polymeric Nano- and Microstructures [\[web\]](#)
15. Special Workshop on Nanomaterials and Their Applications [\[web\]](#)
14. 3D Printing of Transparent and Conductive Heterogeneous Hydrogel-elastomer Systems [\[web\]](#)
13. Towards Photo-rechargeable Lithium-ion Battery [\[web\]](#)
12. Garnet-based Li-metal Batteries [\[web\]](#)
11. X-ray Nanotomography reveals 3D Internal Magnetization Structure [\[web\]](#)
10. Electrolyte Gating induced Insulator-to-metal Transition in WO<sub>3</sub> Mechanism Identified [\[web\]](#)
9. Intermolecular Forces for Self-assembly Identified through Simulations [\[web\]](#)
8. Solar CO<sub>2</sub> Reduction Coupled with Water Oxidation – Semiconductor/Metal-Complex Hybrid System [\[web\]](#)
7. Photoelectrochemical Solar Energy Storage – Hydrogen Production vs Direct CO<sub>2</sub> Reduction and Photoredox Flow Batteries [\[web\]](#)
6. Nanogenerators for Self-powered Systems and Large-scale Blue Energy [\[web\]](#)
5. Surface-bound Enzymatic Reactions Organize Microcapsules and Protocells in Solution [\[web\]](#)
4. Data Analytics for Mining Process-Structure-Property Linkages for Hierarchical Materials [\[web\]](#)
3. A Multiscale Approach to Cathode Design Based on Mapping Intercalation Gradients within Individual Particles and across Particle Aggregates [\[web\]](#)
2. Needs and Challenges Associated with High Energy Batteries with an Emphasis on Thermodynamic Underpinnings [\[web\]](#)
1. Understanding the Nature of Chemical and Electrochemical Stability of Electrolytes at Mg Anode Surfaces [\[web\]](#)